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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/690.060	10/21/2003	James N. Dougan	SC12967TP	3491
23125	7590	09/16/2004	EXAMINER	
FREESCALE SEMICONDUCTOR, INC. LAW DEPARTMENT 7700 WEST PARMER LANE MD:TX32/PL02 AUSTIN, TX 78729			LEE, CALVIN	
			ART UNIT	PAPER NUMBER
			2825	

DATE MAILED: 09/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary

Application No.

10/690,060

Applicant(s)

DOUGAN et al.

Examiner

Lee, Calvin

Art Unit

2825

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,13-15,20-24 and 26-29 is/are rejected.
- 7) ☒ Claim(s) 3,5-12,16-19 and 25 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 10/21/03.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

OFFICE ACTION***Claim Rejections - 35 U.S.C. § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 15, 20-23, 26, and 29 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Chen et al* (US 2003/0228769) in view of *Ahlburn et al* (US 5,607,773).

-forming a first dielectric layer 2 of SiCN [claim 1 of *Chen*] overlying a semiconductor substrate 1

-treating the first dielectric layer with an oxygen plasma [Fig. 1B and ¶ 0021]

-forming a second dielectric layer 4 overlying the first dielectric layer 2 [¶ 0022]

In re claim 29, *Chen et al* also discloses that forming the dielectric layer and treating the dielectric layer are performed in the same chamber (i.e., “in situ”) [¶ 0021].

Chen et al, however, does not disclose cleaning or scrubbing the first dielectric layer. Nevertheless, such cleaning after oxygen treatment is known in the semiconductor processing art as evidenced by *Ahlburn et al* disclosing “polymers 9 are removed by an oxygen plasma treatment ... any remaining polymer and dirt is then removed from the surface with a water scrub” [col. 3].

It would have been obvious to one having ordinary skill in the art to have modified the process of *Chen et al* by utilizing cleaning/scrubbing step for the purpose of removing debris.

3. Claims 27 and 28 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Chen et al* and *Ahlburn et al*, as applied to claim 23, in view of *Robinson* (US 6,386,212).

The combination of *Chen et al* and *Ahlburn et al* does not suggest scrubbing with a water-based cleaning solution comprising ammonium hydroxide. *Robinson* suggests scrubbing by contacting the wafer with an ammonium hydroxide solution [col. 3, ln.57].

It would have been obvious to one having ordinary skill in the art to have modified the scrubbing process of *Chen et al* and *Ahlburn et al* by utilizing a water-based cleaning solution comprising ammonium hydroxide for the purpose of better removing any particles from the composite surface [Abstract].

4. Claims 1-2, 4, 13-14, and 24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Chen et al* and *Ahlburn et al* in view of *Tonegawa et al* (US 2002/0155657).

Chen et al is silent about converting a hydrophobic surface to a hydrophilic surface. *Tonegawa et al* discloses “a film that can achieve the effect of the plasma treatment of the invention can be any low dielectric film containing hydrophobic groups having a large molecular structure like MSQ that contains methyl groups, and it may be MHSQ, SiC, SiCN, SiOC, SiCOH, etc. or a porous film of each” [¶ 0082], wherein “by applying the plasma treatment using a He/H₂ mixed gas under these conditions, methyl groups are replaced by hydrogen as shown in FIG. 5B, and the surface thereby turns to hydrophilic” [¶ 0072]. By definition, “methyl groups are hydrophobic, whereas hydrogen groups and dangling bonds are hydrophilic” [¶ 0064].

It would have been obvious to one having ordinary skill in the art to have modified the process of *Chen et al* and *Ahlburn et al* by utilizing a hydrogen treatment to convert a hydrophobic surface to a hydrophilic surface, taught by *Tonegawa et al*, for the purpose of improving adhesion.

In re claim 4, Tonagawa et al also discloses “MSQ I used as the second interlayer insulation film 10” [¶ 0083], wherein “structure like MSQ that contains methyl groups, and it may be MHSQ, SiC, SiCN, SiOC, SiCOH, etc. or a porous film of each” [¶ 0082].

Allowable Subject Matter

5. Claims 3, 5-12, 16-19, and 25 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. None of the cited arts teaches or suggests converting a hydrophobic surface to a hydrophilic surface by oxygen treatment.

Any inquiry concerning this communication from the Examiner should be directed to *Calvin Lee* at (571) 272-1896 from 7:00 to 5:00 (Monday-Thursday). If attempts to reach the examiner by telephone are unsuccessful, Art Unit 2825's Supervisory Patent Examiner *Matthew Smith* can be reached at (571) 272-1907.

Any inquiry relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0596. The fax phones are (703) 872-9318 for regular communications and (703) 872-9319 for After-Final communications.

CL

C. Luehman
CAROL LUEHMAN
PATENT EXAMINER

September 10, 2004